is also much less. The heavier but more local rains of summer have a comparatively slight influence. The lowest stages occur in October and November, and are coincident with the period of minimum rainfall. The Roanoke at Weldon on the average is 5 feet lower in November than in March.

Mean stages of the Cape Fear River.
MONCURE, N. C.

This station is on the Haw River, 2 miles above its junction with the Cape Fear and 171 miles from the mouth of the latter. Drainage area above the station, 1,649 square miles. Length of record, 5 years. Flood stage, 25 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
8.8	9.2	8.5	8.2	7.4	7.0	6.5	8.0	4.9	7.6	8.0	9.0

FAYETTEVILLE, N. C.

This station is 112 miles from the mouth of the Cape Fear. Drainage area above station, 4,493 square miles. Length of record, 17 years. Flood stage, 38 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
10.3	14.7	13.2	11.0	8.0	6.5	6.9	9.1	6.3	4.6	5.0	8.0

Normal precipitation over the Cape Fear Basin.[1]

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
3.60	4.38	4.34	3.63	4.26	4.31	5.58	5.78	3.78	3.06	2.75	3.60

[1] Computed from the normal rainfall at Greensboro, Chapel Hill, Pittsboro, Ramseur, Moncure, and Fayetteville.

Mean stages of the Tar River.
TARBORO, N. C.

This station is 46 miles from the mouth of the river and 25 miles above Greenville. Drainage area above the station, 2,290 square miles. Length of record, 5 years. Flood stage, 25 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
8.4	8.4	9.2	7.4	5.4	5.9	4.9	7.5	4.5	2.3	3.0	5.4

GREENVILLE, N. C.

Located 21 miles from the mouth of the Tar at Pamlico River. Drainage area above station, 2,678 square miles. Length of record, 5 years. Flood stage, 13 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
8.8	9.1	9.7	8.0	6.6	6.9	6.4	7.9	5.9	4.0	4.4	6.3

Normal precipitation over the Tar River Basin.[1]

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
3.30	4.32	4.20	3.57	4.13	4.33	6.05	6.22	3.68	3.12	2.57	3.55

[1] Determined from the normal rainfall at Henderson, Louisburg, Nashville, Tarboro, and Greenville.

Maximum and minimum river stages.

Station.	Maximum stage.		Minimum stage.	
	Height.	Date.	Height.	Date.
Roanoke River.	*Feet.*		*Feet.*	
Randolph, Va......	25.7	Oct. 21, 1906.......	3.0	Sept. 5, 6, 7, 1909.
Danville, Va.......	13.1	Mar. 20, 1899.......	− 0.6	Oct. 20, 31, Nov. 12, 1904.
Clarksville, Va......	27.0	Nov. 26, 1877.......	− 0.7	Oct. 9, 10, 1905.
Weldon, N. C.......	60.3	Nov. 26, 1877.......	6.8	Jan. 2, 1900.
Cape Fear River.				
Fayetteville, N. C..	67.5	Aug. 29, 1908.......	0.2	Oct. 8, 9, 1897.
Moncure, N.C......	25.9	Feb. 8, 1899.........	0.2	Sept. 2, 1907.
Tar River.				
Tarboro, N. C......	28.0	Sept. 1, 1908........	− 0.6	Oct. 2, 1897.
Greenville, N. C....	22.3	Nov. 7, 1887........	2.8	Nov. 29, 30, 1907.

The average annual precipitation in the Basin of the Cape Fear River is about 7 inches greater than in the Roanoke, and the late winter or early spring maximum is more pronounced as well as the summer maximum. The highest average stage in the Cape Fear occurs in February and the lowest in October,

the range being much greater than for the Roanoke. (February 14.7, October 4.6, range 10.1 feet.) As a rule, however, flood stages are more frequent in the Roanoke than in the Cape Fear.

The course of the Tar River is similar to that of the Cape Fear and the rainfall over its basin practically the same. It will be sufficient, therefore, to give the tabular matter without further comment.

STREAM FLOW OF THE PEARL AND PASCAGOULA RIVERS IN MISSISSIPPI.[1]

By FRANK MONTGOMERY, Observer, Meridian, Miss.

The drainage areas of the Pearl and Pascagoula river systems cover 15,718 square miles, embracing about three-fourths of southern Mississippi. The northern limit of the basin of the Pearl River is in east-central Mississippi, at latitude 33° 25'. The length of this river is 342 miles, and its drainage area is 8,024 square miles. It flows southward through the upper 115 miles of its course to a point about 15 miles below Jackson, and from there on it flows slightly east of southward, and the lower 85 miles of its course forms the boundary between extreme eastern Louisiana and Mississippi. The river is navigable to Jackson. The Pascagoula River flows southward into Pascagoula Bay. It is 78 miles in length, being formed by the confluence of the Chichasawhay and Leaf rivers. The total drainage area of the system is 7,694 square miles. The Chickasawhay drains 2,781 square miles. Its basin extends as far northward as latitude 32° 45' at a point about 30 miles from the Alabama line. The general course of this river is southward. Small steamboats have ascended the river as far as Shubuta, but the principal commercial value of these rivers is their extensive use for rafting logs. The general course of the Leaf River is southeastward. Its basin covers a pear-shaped area of 3,369 square miles, lying between the Pearl and Chickasawhay rivers.

An interesting feature of this discussion is a comparison of the stream flow of these two systems to demonstrate the extent to which topography controls the run-off of rivers. The divide separating the Pearl River watershed from that of the Mississippi River on the west ranges from 400 feet to nearly 600 feet in elevation, and that between the Chickasawhay and Tombigbee on the east is about the same height, while nearly as great elevations separate the two systems under discussion.
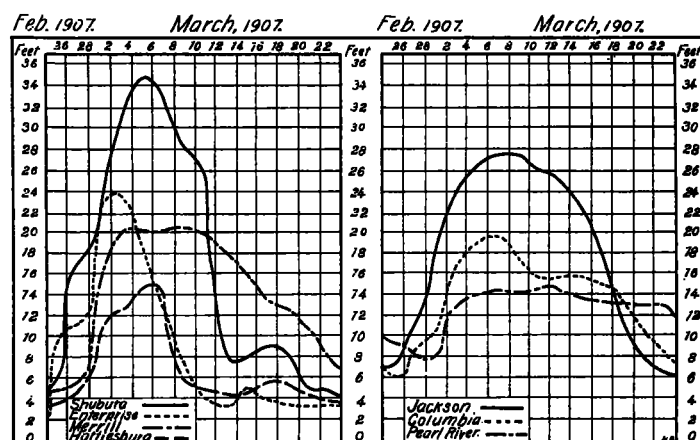

FIG. 1.—Hydrograph of floods during period from February 24 to March 24, 1907; the section to the left being for Shubuta, Enterprise, Merrill, and Hattiesburg on the Pascagoula River system; and the one to the right being for Jackson, Columbia, and Pearl River, La., on the Pearl River.

Yet fig. 1 reveals a very marked difference in the rapidity of run-off of these two river systems. This is accounted for by the

[1] Tables furnished by Mr. J. H. Scott, Section Director, Vicksburg, Miss.

fact that over most of the Pearl River Basin there is a gradual rise from the main streams up toward the headwaters of their tributaries, where the country stretches off in flat table-lands, while the Chickasawhay and to some extent the Leaf and their main tributaries flow through comparatively narrow valleys, and the courses of the smaller branches soon lead into the hills, which are generally steep with their tops towering from 100 to 200 feet above the main valleys. In fact the Alabama and Vicksburg Railroad tunnels through one of these ridges 6 miles west of Meridian. The rainfall during the period covered by fig. 1 was as follows at the various river stations: Jackson, 4.49 inches; Columbia, 4.60 inches; Pearl River, La., 4.85 inches; Enterprise, 9.78 inches; Shubuta, 4.18 inches; Hattiesburg, 6.18 inches, and Merrill, 10.20 inches. The unusually sudden rise at Merrill during this flood was due to a 24-hour rainfall of 7.08 inches in that vicinity on February 28, while the greatest rainfall in 24 hours at the other stations ranged from 1.50 inch to 3.00 inches.

The average rainfall is practically the same in the basins of both rivers. It contains two periods of maximum, one in February and March, and the second in June and July in the Pascagoula and in July and August in the Pearl Basin. A period of minimum rainfall occurs in October, and there is a secondary minimum in May. The highest average stage of water in the Chickasawhay and Leaf rivers occurs in February, but the more sluggish current of the Pearl causes its highest waters to lag behind the maximum rainfall and occur in March. The average stage during May is nearly as high as in February or March. This is due to the heavy rains accompanying spring thunderstorms. The maximum rainfall period of summer causes only a slight rise in the rivers, because of the increased evaporation due to high temperature, the greater absorption of moisture by vegetation, and the greater capacity of cultivated soil for retaining moisture.

There were from 1 to 4 floods each year from 1905 to 1909, inclusive, in all of these rivers, being of about the same frequency in both the upper and lower portions of the Pearl and Chickasawhay rivers, but less frequent in the Leaf River. But the average number of days annually that flood conditions continued is much the greatest in the upper and extreme lower portions of the Pearl, being 69 days at Pearl River, La., 43 at Jackson, 24 at Columbia, 20 at Shubuta, 14 at Merrill, and only 4 at Hattiesburg. The greatest number of days in any one year with flood stages at Hattiesburg was 5, in 1905 and in 1906; while at Jackson the river was in flood 70 days in 1909, and 100 days at Pearl River, La., which is 22 miles from the mouth of the river. There have been no floods in any of these rivers during 1910.

The following are the highest and lowest stages recorded on all these streams:

Stations.	Maximum stage.		Minimum stage.	
	Height.	Date.	Height.	Date.
	Feet.		*Feet.*	
Pearl River.				
Jackson.............	36.0	Mar. 31, 1902..	0.3	Oct. 26, 1904; Nov. 1–2. 1908.
Columbia.........	27.6	June 5, 1909...	2.8	Oct. 25–Nov. 7; Nov. 16–26, 1908.
Pearl River.......	16.7	June 8, 9, 1909..	2.9	Nov. 14–21, 1908.
Pascagoula River.				
Merrill...........	25.1	June 4, 1909...	0.4	May 18, 1910.
Chickasawhay River.				
Enterprise.........	35.0	April, 1902.....	−0.4	Nov. 1–4. 1909.
Shubuta...........	45.0	April, 1900.....	0.0	Nov. 26–Dec. 2, 1908.
Leaf River.				
Hattiesburg.......	20.5	Feb. 12, 1905...	2.2	Nov. 27–Dec. 1, 1908.

Mean stages of the Pearl River.
JACKSON, MISS.
This station is 242 miles from the mouth of the river, and 132 miles above Columbia, Miss. Length of record, 6 years. Flood stage, 20 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
6.4	13.5	14.6	11.5	14.1	7.6	3.5	5.2	1.7	1.4	2.3	3.4

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COLUMBIA, MISS.
This station is 132 miles below Jackson, Miss., and 110 miles above the mouth of the river. Length of record, 6 years. Flood stage, 18 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
7.2	11.2	11.7	10.7	12.0	8.6	5.6	5.7	4.6	6.4	4.1	5.4

PEARL RIVER, LA.
This station is 22 miles above the mouth of the river, and 88 miles below Columbia, Miss. Length of record, 4 years. Flood stage, 12 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
7.4	9.6	11.4	9.4	11.8	9.4	7.4	7.3	5.5	6.8	4.3	6.3

Mean stages of the Chickasawhay River.
ENTERPRISE, MISS.
This station is 144 miles from the mouth of the river, and 38 miles above Shubuta, Miss. Length of record, 6 years. Flood stage, 18 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
3.8	7.5	6.4	5.0	7.2	4.6	......	......	......	......	1.2	2.6

SHUBUTA, MISS.
This station is 38 miles below Enterprise, Miss., and 106 miles from the mouth of the river. Length of record, 6 years. Flood stage, 25 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
7.5	12.7	11.3	8.4	12.9	8.2	......	......	......	......	2.2	4.7

Mean stages of the Leaf River.
HATTIESBURG, MISS.
This station is 60 miles from the mouth of the river. Length of record, 6 years. Flood stage, 17 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
5.2	7.1	6.4	6.1	6.8	5.0	......	......	......	......	3.0	4.0

Mean stages of the Pascagoula River.
MERRILL, MISS.
This station is 78 miles from the mouth of the river, near the junction of the Chickasawhay and Leaf rivers. Length of record, 6 years. Flood stage, 20 feet.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
8.4	11.1	11.8	9.8	11.6	8.5	5.2	5.5	3.5	4.2	2.6	5.3

Normal precipitation over the Pearl River Basin.[1]

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
4.77	5.81	5.83	4.80	4.18	4.05	5.64	5.16	3.41	2.39	3.16	4.89	54.69

[1] Computed for the Pearl Basin from the normal rainfall at Brookhaven, Crystal Springs, Hazelhurst, Jackson, Lake, Louisville, Magnolia, and Pearlington.

Normal precipitation over the Chickasawhay River Basin.[2]

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
4.85	5.55	5.31	4.62	4.04	5.20	5.65	4.83	3.75	2.38	3.34	5.05	54.57

[2] Computed for the Chickasawhay Basin from the normal rainfall at Leakesville Meridian, and Waynesboro.

Normal precipitation over the Leaf River Basin.[3]

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
4.99	5.88	4.92	4.44	4.63	5.36	6.68	5.21	4.29	1.84	3.11	4.52	55.87

[3] Hattiesburg being the only station in the basin with a record of sufficient length to establish a satisfactory normal, the normal for this station is used. There are no stations along the Pascagoula River with sufficient length of record to establish rainfall normals, so the normal precipitation for the Pascagoula system may be obtained by combining those for the Chickasawhay and Leaf rivers.